Oxidative Lactonization of Diols Catalyzed by Cp*Ru(PN) Complexes
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We have recently developed Cp*Ru(II) catalyst systems bearing a series
of chelating primary amine ligands with “NH/metal bifunctional units” for
highly effective organic transformations. One of the most intriguing
features of the catalyst system Cp*RuCl[Ph₂P(CH₂)₂NH₂-κ²-P,N] with base
is its extremely high activity for reversible hydrogen transfer between
alcohols and carbonyls. Consequently, the catalyst system is highly
effective for the intramolecular hydrogen transfer including racemization of
chiral nonracemic sec-alcohols¹ and isomerization of allylic alcohols.² We
have now extended this feature to the intermolecular hydrogen transfer and
developed oxidative lactonization of diols using acetone as an oxidant, in
which a wide range of 1,4-diols are vary rapidly convertible to the
corresponding lactones under mild conditions.³ The bifunctional nature of
the well-defined Cp*Ru(PN) complex underlies the high efficiency as well
as unique chemo- and regioselectivity of this method, which provides an
efficient access to γ-butyrolactones including biologically important lactone
lignans, L-factor, or muricatacin.

R¹R⁰R²OH Cp*Ru(PN) cat. acetone

R¹R²O

R¹R² OH

lactone lignans

R = n-C₅H₁₁: L-factor
R = n-C₁₂H₂₅: muricatacin